DAMOP08-2008-000048

Abstract for an Invited Paper
for the DAMOP08 Meeting of
the American Physical Society

Rovibrational Dynamics and Photoassociation of Cold Heteronuclear Dimers in Electric Fields

ROSARIO GONZALEZ-FEREZ, Universidad de Granada, Granada, Spain

We investigate the effects of a strong static electric field on the rovibrational spectra of diatomic heteronuclear molecules in their electronic ground state. A full rovibrational approach is developed and applied including the coupling of the vibrational and rotational motions and taking into account the dependence of the electric dipole moment on the internuclear distance. For several alkali dimers, LiCs, LiRb, NaCs, KRb and RbCs [1,2], a detailed analysis of the impact of the electric field is performed: the orientation, the hybridization of the angular momenta and the squeezing of the vibrational motion of the highly excited levels close to the dissociation threshold are anaylzed. In addition, we discuss the formation of ultracold molecules via stimulated emission followed by a radiative deexcitation cascade in the presence of a static electric field [3,4]. By analyzing the corresponding cross sections for the LiCs molecule, we show the possibility to populate the lowest rotational excitations via photoassociation. The modification of the radiative cascade due to the electric field leads to narrow rotational state distributions in the vibrational ground state. External fields might therefore represent an additional valuable tool towards the ultimate goal of quantum state preparation of molecules.

[1] R. Gonzalez-Ferez, M. Mayle, & P. Schmelcher, Chem. Phys. **329** 203 (2006)
[2] R. Gonzalez-Ferez et al, preprint (2008)
[3] R. Gonzalez-Ferez, M. Mayle, & P. Schmelcher, Europhys. Lett. **78**, 53001 (2007)
[4] R. Gonzalez-Ferez, M. Weidemüller, & P Schmelcher, Phys. Rev. A **76**, 023402 (2007)